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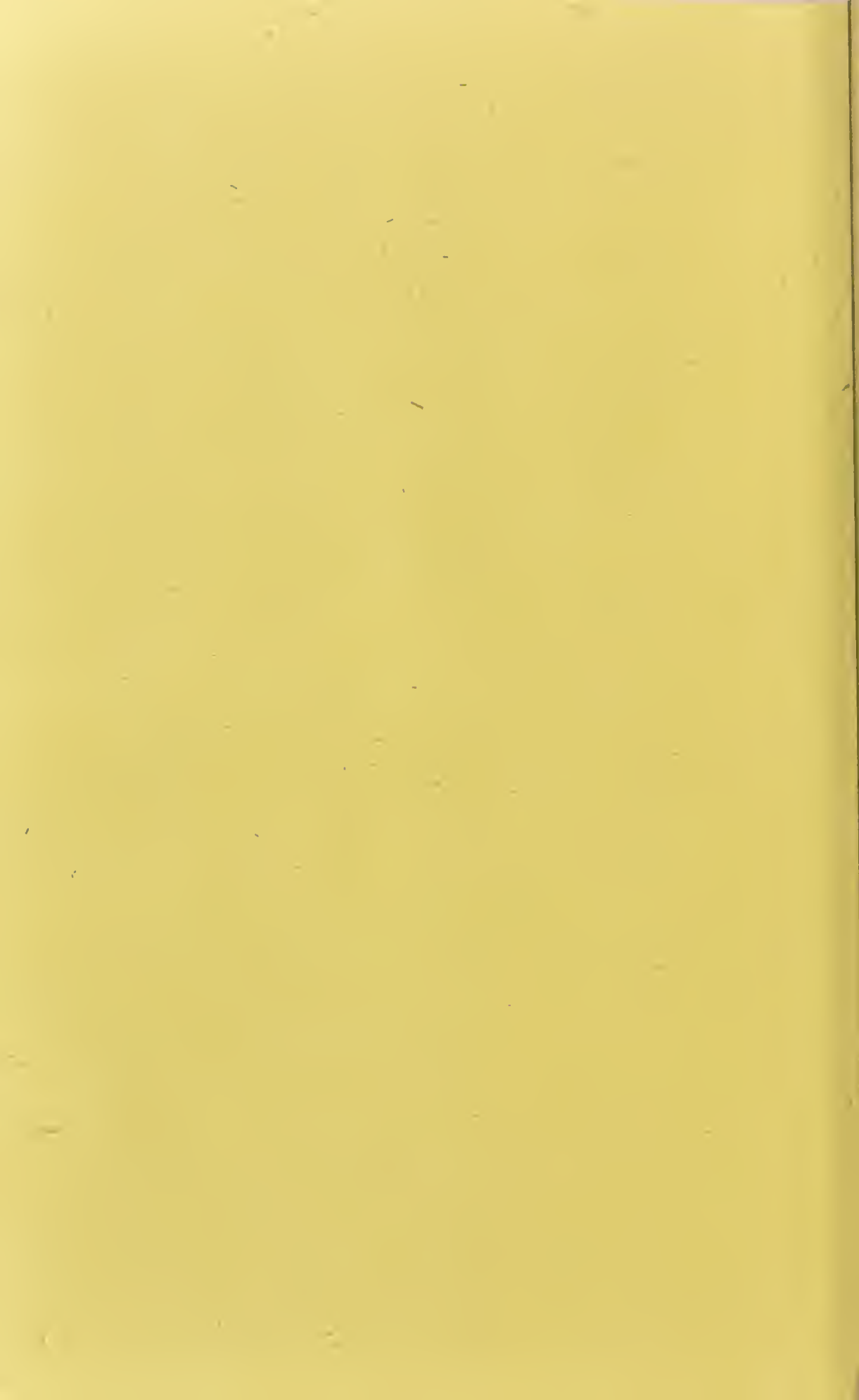
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# SANITARY REFORM:

IS IT A REALITY, OR IS IT NOT?

BY JOHN PARKIN, M.D., F.R.C.S.,

FORMERLY HER MAJESTY'S MEDICAL INSPECTOR FOR CHOLERA IN THE  
WEST INDIES.

*"Salus populi suprema est lex." Inscribed on one of the 12 Tables  
(of Laws) at Rome.*

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## P R E F A C E .

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THE general interest manifested at the present moment in the question of Sanitary Reform, and the probability that the subject will be brought forward during the approaching session of Parliament, will be a sufficient apology for the publication of the following observations. The subject has, in fact, formed a leading topic, during the recess, with the majority of the Members of Parliament, in their addresses to their constituents; so much so, that "The Times" expressed its surprise, that Mr. Bright, in his recent speech at Birmingham, "said not a word . . . about those Sanitary Questions, to which the loftiest intellects of the country are obliged to condescend." If this reproach be applicable to a non-professional person—Statesman though he be—it will apply with ten times more force to medical men, and particularly to one, who has devoted a large portion of his life to an investigation of the Causes productive of Disease. For such a one to have remained silent, when, as he believes, the subject is entirely misunderstood, would have been something more than a reproach—it would have been a dereliction of duty. For instance, "The Standard," while referring to the late Sanitary Conference at Birmingham, remarked:—"Sir Charles Reid was substantially right when he told the Meeting, that they were on the eve of a great national movement in connexion with the subject which they were discussing. If that be not true, then we are on the eve of something else—namely, a great national disaster." The disaster so much apprehended by this writer, unless prevented, as we may presume, by a great Sanitary movement, is ascribed to "the rapid growth of our towns," which, he adds, "is fraught with a physical *peril* which threatens to become worse every hour . . . and to such a pitch that our civilization will be ready to collapse." According to this view of the case, civilization and its result—the aggregation of people in towns—instead of being a blessing, would be a curse. The reverse, fortunately,

is the fact. Where does fever prevail most in that unhealthy town, Rome? Not in the filthy, over-populated, *Ghetto*, where the Jews swarm like bees in a beehive, and surrounded by every abomination; but in the clean, open, thinly-populated, aristocratic quarters of the city—in the palace of the noble rather than in the habitation of the poor. The Villa Borghese, situated outside the walls, in the midst of its own park-like grounds, is uninhabitable from this very cause. Hence M. Michel has laid it down as a *law*, that population *decreases* the insalubrity of a town like Rome.

We observe the same law with respect to epidemics. In Jamaica, the ravages of the Epidemic Cholera were in an inverse ratio to population. The ratio of mortality in the filthy and populous town of Kingston was 17 per cent.; in the small towns it amounted to 30, 40, and 50 per cent.; while in the villages, or settlements, in the interior the ratio was as high as 60, 70, 80, nay, 90 per cent. of the inhabitants. There was no local cause for this, as these settlements are nearly all in the hilly districts—on calcareous plateaus; while the huts of the independent peasantry in Jamaica are generally clean and better ventilated than the houses of any class of persons in Europe.

Not only are the opinions of the preceding writer entirely erroneous, but the majority of those entertained in the present day, respecting the causation of disease, are in my opinion no less so. As such I have been induced to take, as examples, two recent outbreaks—those of Over Darwen and Lewes—in order to ascertain if the facts connected with these outbreaks receive elucidation by a reference to the prevalent theories of the day—more especially to that on which Sanitary Reform is based. This is the test—the *experimentum crucis*—by which alone the truth of a theory can be ascertained. If it will not stand this test, we shall then know that the theory is an erroneous one.

53, MARGARET-STREET, CAVENDISH-SQUARE,

January 25, 1875.



## THE DARWEN FEVER MANUFACTORY.

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SUCH was the heading of a Letter, addressed by the Rev. H. H. Moore to "The Times" (Nov. 3), caused by an outbreak of Typhoid fever in the above town. Mr. Moore commenced his letter by observing: "It is universally admitted by the best Sanitary and Medical authorities, that this is a disease which ought not to exist, and that it arises only from a flagrant and inexcusable violation of the plainest laws of health and dictates of decency. It would, indeed, do much to make the nature and cause of this disease better known, if it were systematically called 'cesspool fever' or 'sewer gas fever.'" Having arrived at this conclusion, it was only natural that Mr. Moore should have discovered sufficient cause for the production of the disease "in the majority of the streets not being sewered, in the fact of the town being 'cursed' with the 'midden and cesspool system,'\* in the sink stone pipes and the drains from the houses not being trapped (although from the absence of water closets, there could be no emanations of fecal matter from them), and in the contamination of the water"—a gratuitous assumption, as we shall presently find. With all these dreadful causes of disease in full operation, although they do not appear to have excited any apprehension *before* the outbreak, it is not surprising that the writer should exclaim, in a paroxysm of terror and of indignation, "Here then, Sir, is a population of 20,000 people being poisoned. Our lives and those of our families are not safe an hour, and cannot be protected against the poison spread round us everywhere." Dr. Stevens, the Government Medical Inspector, drew almost as bad a picture of the state of the town. He remarked, at a meeting of the Darwen Board of Health, held Oct. 31st: "It was unquestionable, that they were living in the midst of a hot-bed of a dreadful sort, and while it remained disease would remain."† We cannot wonder, then, that these opinions should have been echoed and re-echoed by the Press; and that Over Darwen should have been compared to the "Inferno" of Dante. In fact, as the Editor of "The Darwen News" has remarked: "The letters written to 'The Times' (by Mr. Moore) have had the effect of drawing down upon the town of his adoption, the contempt and derision of the nation, and have given it a notoriety that it will not lose during the lifetime of the present generation." As to the Local Board, the members were stigmatized

\* Instead of being a curse, this system—that of throwing the ashes into the cesspool—is, with the exception of the dry earth system, the best that can be adopted, as the ashes absorb and neutralize the gases given out by the excreta of man.

† "Blackburn Times," Nov. 7, 1874.

as "murderers," while it was said that "every death ought to be laid to their door." The Chairman, in a letter to the Editor of "The Darwen News," stated, that "the Board was charged by the Rev. H. H. Moore with incapacity, shameful neglect, &c.; and he added, 'we (*i.e.*, the inhabitants) are made to pay *in blood* and broken hearts, and in death-shadowed lives, as well as in money, for the privilege of being governed by them.' Nor is this all. Some of his brother clergymen go about the town declaring, 'That if they might have their way, they would hang one half of the members of the present Board, and *draw and quarter* the other half.'" Not a very congenial occupation for the ministers of God; and rather a severe punishment for men who, if they have erred, have erred unintentionally, not intentionally. So much for the honour of being a member of a Sanitary Board. Still, men will "seek the bubble reputation, e'en at the *halter's end*!" With these facts before us, it will, no doubt, be considered an act of temerity on my part, if not a misrepresentation, to add, that I found, on visiting Over Darwen, a few days only after the publication of the preceding letter, and of the visit of the Government Inspector, what appeared to me to be, a well-paved and clean town, with the exception of the outskirts, or, rather, the rows of houses on the adjoining hills—the principal part of Over Darwen being in a valley with hills rising up abruptly on each side. As, however, doctors sometimes differ, not only as regards the morbid state of a patient, but, also, with respect to the dirty condition of a town, I need not dwell on this part of the subject. The question of most importance is, was the outbreak of fever in Over Darwen to be ascribed to the insanitary state of the town? That I will now proceed to consider.

Before doing this, it may be as well to state, that this disease is usually considered, at least by the Sanitarians, to be produced by the decomposition of organic matter, and, more especially, of that which forms the excreta of man. Hence, as one writer has remarked, "typhoid fever, or typhias, as it may be termed, to distinguish it from typhus, Dr. I. Smith, Dr. Murchison, and others, have shown to be a kind of *night soil fever*."\* As such, Dr. Murchison proposed, that it should be called Pythogenic fever, *i.e.*, the product of putrescence. These opinions and conclusions were adopted by Mr. Simon. Referring to the outbreak of typhoid fever at Terling, in 1867, the writer remarked: "The cause of all this terrible sickness and mortality was, of course, evident to their Lordships' Inspector at a *glance*. It was the merest question of *filth*."† The Founders of Sanitary Reform ascribed the production of disease to the emanations from this matter, but, subsequently, its introduction into the water, used as drink by man, has been considered to be as potent a cause of

\* The Registrar-General's Report for 1859.

† Report for 1867, p. 28.

disease. To this cause the outbreaks of typhoid fever at Guildford, Winterton, and other places, have been referred by the Government Medical Officers. Not content with having two strings to his bow, Mr. Simon has lately added a third by adopting a theory of infection. It is as follows :—The late Dr. Snow, in 1854, inferring, that “mere impurity of the water would not cause cholera, unless it were of a specific kind,” advanced the opinion, “that the *materies morbi* of cholera is something which passes from the mucous membrane of the alimentary canal of one person to that of another; this it can only do by being *swallowed*.” This was effected principally, according to Dr. Snow, in consequence of the *materies morbi*, or the diseased evacuations, escaping from the cesspools and sewers, and finding their way into the drinking water. This notion has been taken up by Dr. Budd, and applied to typhoid fever. He remarks: “The internal discharges constitute the material by which the fever is mainly propagated,” being conveyed by sewers, cloacæ, &c., to the drinking water. Dr. Budd also infers, that the virus is spread by tainted hands, linen, bedding, clothes, &c., and by emanations borne on the air.\* This is the theory that has been adopted by Mr. Simon, as we shall find by the following quotation :—“The facts which Dr. Budd adduces, from his own experience and from that of others, are, in my opinion, sufficient to prove that the *contagion* of typhoid fever is *importable* by persons who have it.”† With these remarks we may now proceed to a consideration of the outbreak at Over Darwen.

Dr. Stephens has referred the cause of the outbreak to two circumstances—“First, it had been conveyed to every one by the water they drank, for every one drank the water. That was his first assumption.”‡ The way in which the water was *supposed* to have become contaminated, was from the drain of a private house, which crossed the water conduit between the source and the reservoir. The pipe (an iron one) had become almost completely blocked up, so that the sewage, instead of passing through, had leaked out into the surrounding soil; and thus, as was imagined, had found its way into the conduit. If, however, it had been possible for the sewage to penetrate the conduit, it would have been still more easy for the water to have found its way out through the same interstices, and the fact would have been made known by the escape of water on the surface. But no such flow was observed. Dr. Stephens also tells us, that “this kind of thing had been going on for years”—a fact that was confirmed to me by persons on the spot, the contents of the pipe being almost dry. How, then, we may ask, could a cause, which had thus been in operation for a number of years, account for a sudden outbreak of

\* On Typhoid Fever, 1873.

† Report to the Privy Council, 1861.

‡ Statement before referred to in “The Blackburn Times,” from which all the subsequent quotations of Dr. Stevens are also taken, no official Report having been as yet published.



fever—the suddenness of the outbreak resembling the explosion of a mine rather than anything else? The disease commenced on the 8th of October, and, by the end of the month, there were, or had been, 1,500 cases, in a population of about 20,000. Then, again, if a cause like this were productive of such dire results, how was it that no cases of fever had been observed previously; there having been only one visitation of typhoid fever in Over Darwen, before the present one, and that thirteen years previously, in 1861? There can only be one answer to the question: this is, that the contamination of the water by sewage, if it occurred, had nothing to do with the outbreak of fever in this town. This inference is confirmed by the analysis of the water, taken from the reservoir *before* the drain was repaired. Mr. Railton, analytical chemist, stated, at the Meeting of the Darwen Local Board, held November 9th, that there was no sewage pollution in the samples (of water) he had analysed (seven in number, and taken from the conduit, near the drain, as well as from the reservoir) nor any animalculæ.....“The water was not the cause of the epidemic.” Some surprise and dissatisfaction having been expressed at this announcement, Mr. Railton added: “He would stake his reputation on his opinion, that the fever did not arise from the water, as inferred from the Report of Dr. Stevens.” This conclusion has been since strengthened by another circumstance. This is, that although the epidemic had almost, if not entirely, disappeared by the middle of November, a fresh outbreak occurred towards the end of the month, and, what is more remarkable, the cases, this time, presented a more virulent type than previously. As the drain had been effectually repaired three weeks before, and as the reservoir had, also, been emptied and cleared out—the people deriving their supply of water direct from the source—the contamination of this fluid by sewage water could not have been the cause of the last outbreak. We may also conclude, that it was not the cause of the first, as there is thus proof, that there was some other cause in operation productive of the disease; and it would be contrary to all analogy, and to the simplicity of nature’s operations, to suppose, that there were two causes in operation productive of precisely the same results.

To show how little influence the impurity of the water has on the production, or its purity on the prevention, of disease, I may refer to Glasgow, which is supplied with water from Loch Katrine—the purest water in the world. During the ten years, 1860-9, since this supply was laid on, the average annual rate of mortality was 31 per 1,000 inhabitants: in the four previous years, 1856-9, the rate was 29·50—one and a half per 1,000 less. In the week ending Jan. 2, 1875, the rate, according to the “Glasgow Herald,” was 64 per 1,000, and, in some districts, 68! At this rate, Glasgow would become depopulated in fifteen years! The same result, viz., a high rate of mortality with a supply of the purest water, is observed in Manchester, Rome, and other places. Nor is Glasgow exempt from the ravages

of typhoid fever any more than other towns. Referring to the prevalence of fever in 1873, the Registrar-General for Scotland remarks: "Fever presented somewhat of a peculiarity during the past year, in that its leading type was enteric fever in the eight towns" (of Scotland). ..... "This peculiarity was almost solely caused by the *immense preponderance of enteric fever in Glasgow* over typhus fever; there having been 259 deaths from enteric fever, and only 79 from typhus fever."\*

Although not stated in express terms, Dr. Stevens would seem to imply, that the water had become contaminated by infectious matter, as he remarked, "they had clearly had one case of fever imported into the town by a person who came from Scotland." And he added, subsequently: "He asked where was *that* first case of fever, and he was told that it had occurred within a few yards of their distribution pipe;" in fact, in the house the drain from which crossed the conduit pipe, thus implying that the disease had been imported, and that the contamination of the water was due to *infectious* matter as well as to fecal matters. Let us see, then, if this hypothesis will hold good.

As regards the importation of the disease, there is not a particle of evidence to support the conclusion. The young lady, the unfortunate subject of this discussion, was not attacked, as I am informed by her father, until three days after her arrival; she could not, therefore, have brought the disease with her. In the next place, this gentleman says, in his letter to me, "I told Dr. Stevens that my medical attendant, Dr. Aspinall, had assured me there had been other cases in the town before, but the only case I could then specify was that of a clergyman at Hoddesdon, which is not strictly in the town. Since then, I have been informed by one of the family, that a case had occurred in the house of a gentleman, well known and of high social position, *in the town*, the patient being a young lady visiting the eldest daughter of the gentleman in question." The theory of importation, therefore, in the case referred to, thus falls to the ground. The fact, that this young lady was attacked so soon after her arrival, admits of a ready explanation. It is a *law* common to all diseases—endemic as well as epidemic, non-contagious as well as contagious—that strangers are invariably attacked before the residents, the same when they come from a healthy as when they arrive from an infected district.† Having disposed of this question, it only remains to ascertain, whether the disease was subsequently propagated by means of infectious matter conveyed to the water in the manner indicated. If such had been the case, it could only have been by the medium of the sewage water that entered the conduit. But we have seen that the water, according to the analysis of Mr. Railton, previous to the repairing of the drain, did not contain a trace even of sewage matter.

\* Supplement to the Monthly and Quarterly Returns, for 1873.

† *Vide* Epidemiology, chapt. Propagation of Cholera, p. 243.

That it did not contain infectious matter, or any other matter injurious to health, can be shown in another way. It appears by a statistical table handed in to the Darwen Local Board, by an officer appointed for the purpose, that there were 1,156 houses, containing a population of 6,796, supplied with the town, or suspected, water. In these houses 2,035 cases had occurred, and 104 deaths. On the other hand, there were 87 houses, containing 552 inmates, that derived their supply of water from other sources. In the last houses, there had been 126 cases and 8 deaths. The proportion of deaths and of cases, in these respective instances, is shown in the following table:—

TABLE.—Per-centage of cases and of deaths in Over Darwen.

Sources of Water Supply.	Cases.	Deaths.
Town Water . . . . .	29.94	5.11
Other Water . . . . .	22.82	6.35

It is thus apparent, that the ratio of mortality—calculated on the cases—was greater with those that did *not* drink the town water than with those who did. The disease, therefore, assumed a somewhat severer form with the former than with the latter—a sure proof that the town water was not contaminated with any injurious substance, either infectious or otherwise. The cases, it is true, were less, with those that did not drink the town water than with the other class, but this circumstance may be explained, in all probability, by the fact that these persons lived on the heights above the town—situations to which the water could not be carried. Now it is precisely in such situations, that epidemic diseases prevail less than in low-lying districts: it having been laid down by me as a *law*, regulating the march of epidemic diseases, that they prevail to the greatest extent in alluvial soils, less on secondary strata, and least of all on primary formations.\*

We will now examine the second assumption of Dr. Stevens. He remarked: “The other assumption was, that they had been reeked for so many years with bad drainage and unwholesome cesspools, that a bad atmosphere had been made; and, as a consequence, disease had been distributed among the inhabitants.” This bad atmosphere was produced, according to Dr. Stevens, principally by the emanations from fecal matter, for he stated previously: “The

\* “Remote Cause of Epidemic Diseases.”



abominable filth he had seen : the acres of uncovered excrement that they had got in the town, had never been equalled in his experience." By this a stranger might infer, that there were really acres of uncovered excrement, instead of its being contained in separate and distinct reservoirs, attached to each house. Not having poked my nose into any of the cesspools, I cannot answer for the emanations they may have given off; but I walked along the backs of the houses, where these cesspools are situated, but could perceive no disagreeable odour—the reason being, that the matter in them is never allowed, I understood, to accumulate for any long period. Let us allow, however, for the sake of argument, that the state of this town is, or was, as bad as it has been represented; still, this is a state that had been in existence for many years; but there has been only one visitation of typhoid fever in Over Darwen before, viz., in 1861. At this time, the Government Inspector, Dr. Greenhough, stated, that the outbreak was not caused by the filthy state of the town. As the Board of Health had been established shortly before, and as a good many sanitary improvements have been carried out since, we may infer, that the state of the town is not worse now than in 1861. How is it, then, that a cause, which gave rise to such dire results in Oct., 1874, produced no similar or sensible effect during the previous thirteen years? Was this matter shut up, all this time, in Pandora's Box, and then opened by some wicked elf in order to spread disease and death among the inhabitants of this maligned town? Such must have been the case, if the emanations from this matter had any influence in the production or the spread of the fever in Over Darwen. Besides, the disease was not confined to those houses in which the accumulation of this matter is the greatest: there was a case, I understood, in every house in that well-built and respectable row of houses, called Park Villas, and which had only been inhabited about two months. Now there could have been no great accumulation of excrementitious matter in these houses, at all events; and yet the result was the same. Then, again, the epidemic was not confined to Over Darwen; it prevailed at the same time, and to a greater or less extent, in a number of other towns both in Lancashire and Yorkshire; some of which had cesspools, others not; some being well and efficiently drained, others not at all. It is clear, therefore, from these facts, that the emanations from the cesspools, like the contamination of the water, had nothing to do with the production of typhoid fever in Over Darwen. This conclusion is strengthened by another fact, viz., that although nothing had been done for the removal of this matter, or for lessening the emanations arising from it, the disease had sensibly abated at the time of my visit—the beginning of November; there having been, I was informed, only two or three fresh cases the day before. There has been, it is true, a fresh accession of cases at the end of November, but they were not numerous, the deaths from fever for the week ending

December 5th, being only five, while the epidemic had entirely ceased by the end of the month. As to the inference of Dr. Stevens that the seeds of the disease having been sown, the emanations from the cesspools produced an atmosphere favourable to its spread, there is no proof that the disease was imported; while it is certain that, if it were, these circumstances did not add intensity to it. Besides, we shall find hereafter, that typhoid fever spreads quite as readily where these emanations do not exist, as where they do! Then, again, although the epidemic in Over Darwen has been very general, it did not assume a severe or malignant type, the total deaths from fever having been 112. As the cases amounted to 2,161, this gives a ratio of mortality of 5.18 per cent., a very low rate, the average rate in typhoid fever being about 9 per cent.

As so much has been said respecting the sanitary state of Over Darwen, it may be as well to add the following statistics of the mortality during the last three weeks of the epidemic.

Date.	Deaths from Fever.	Total Deaths.	Annual ratio per 1,000.
Dec. 17 . . . .	4	8	15.54
„ 24 . . . .	2	11	21.18
„ 31 . . . .	2	13	25.08*

This gives an average rate of 20.90 per 1,000. In the week ending January 8th, 1875, the death rate in London was 35 per 1,000, and the average in seventeen of the large towns, in England, 39—the lowest, Portsmouth, being 19, and the highest, Manchester, 49! So far, then, from being a fever-nest, Over Darwen, at this period, was, with the exception of Portsmouth, the healthiest of the large towns in England. And yet nothing had been done at this period for improving the sanitary condition of the town, with the exception of the means, previously mentioned, for preventing the contamination of the water, evidently not a cause of the outbreak.

That the contamination of the water, and the emanations arising from the cesspools, could not have been the cause of the outbreak in Over Darwen is a conclusion at which we might have arrived *a priori*, and from the simple fact, that typhoid fever was unknown in England before 1827; and in Scotland until 1847; although both these causes must have been in operation, in the majority of towns

\* "The Over Darwen News," January 2, 1875.



in Great Britain, from time immemorial. This was more particularly the case in London, where the excreta of nearly a million of persons were collected in cesspools, that were seldom emptied: while the water used for drinking was more or less contaminated with the same matter. On the other hand, typhoid fever not only commenced in England shortly after the inauguration of sanitary reform, but it has been gradually increasing, both in extent and in intensity, from that time to the present, and *pari passu* with the adoption of sanitary measures. And yet we are told, this is a disease that ought not to exist: that it arises only from the neglect of sanitary precautions. If so, typhoid fever ought only to exist in those towns that are in an insanitary state; but it will be found, on inquiry, that it prevails as frequently in clean as in filthy towns, and in those which are in the best as well as those which are in the worst sanitary state; and in the sumptuous palace, as well as in the filthy hovel. To say, therefore, that this disease can be prevented, by the adoption of the present so-called sanitary measures, is a delusion—a chimera. By no one has this delusion been kept up so much as by Mr. Simon. In 1859, he remarked, while referring to an outbreak of typhoid fever at Windsor; “The disease was one of those common *filth-fevers*, which occasion in England and Wales, annually, about 18,000 *preventable* deaths.\*” And yet, Windsor is a remarkably clean town, while it had been well and efficiently drained some time before. Even as late as 1867, Mr. Simon exclaimed, in commenting on a severe outbreak of typhoid fever at Terling; “The one *preventable* disease killed a larger proportion of the population than all the causes of death put together ought to have killed there in two years.” Were it the fact, that the appearance of this disease or its recurrence could be prevented; its mitigation or arrest, after its appearance, ought to be equally easy, but no such result has been witnessed. On the contrary, Mr. Simon states, “That sanitary administration has its hopes of success in preventing, *not* in arresting, great epidemics.”† This is the rock on which the Sanitarians have struck; it being easier to arrest the progress of an epidemic after it has appeared, than to prevent its return, which never will be, never can be, effected; unless we could discover a method of putting out the fires of Etna and of Vesuvius. The return of some of the diseases called endemics may be, and has been, prevented; while we have many examples of the arrest of epidemics, only the methods adopted were directly opposed to those now in vogue. Hippocrates, for instance, arrested the progress of a plague, in one of the Grecian cities, by covering the adjoining marshes with water, for effecting which Divine honours were rendered him subsequently. A similar experiment was tried at Breda, in 1748, and

\* “Report of the Medical Officer of the Privy Council, 1859.”

† Annual Report to the Local Government Board, with regard to the year 1873, p. 8.

at Geneva and Demerara during the present century, and with the same result. The authorities in London also, in one of the visitations of plague in this city, ordered all the dung hills and other accumulations of *filth*, which had been carefully covered up at the commencement of the epidemic, to be *uncovered*: thus diffusing over the whole town the most disgusting odours. This was no sooner done than *the plague was stayed*! I, also, was enabled to obtain a similar result, although on a small scale, and by other means, during the prevalence of the epidemic cholera in the West Indies.\* If sanitary reform were anything but a name, we ought to have witnessed similar results in the present day, but not an instance has been recorded. And yet, as Dr. Christison remarked, at the Social Science Meeting, in 1861, during a discussion on sanitary reform, "Were this a well established principle in social science, the extinction of so deadly a malady (typhoid fever) should be no very difficult matter."

Not only has Mr. Simon proclaimed, for so many years, that typhoid fever, as well as other diseases, can be prevented, but he had the folly and the rashness to propose, in 1867, that the Water Companies should be made responsible for outbreaks of typhoid fever like the Railroad Companies for accidents. And he added:—"It seems to me, that the time has now come, when, not only as regards Water Companies, but also as regards *local sanitary authorities*, certain sorts of malfeasance should involve an obvious and unquestionable liability to pay *pecuniary damages* to persons whom the malfeasance has injured."† Strange as it must appear, five years before these recommendations were made, Mr. Simon had adopted, as previously shown, the theory of Dr. Budd—a theory that ascribes both the origin and the propagation of typhoid fever solely to infection. If so, the Water Companies cannot be answerable for the propagation of typhoid fever: they cannot prevent the introduction of infectious matter into the water: it is the doctors and the nurses who will be responsible for this if anybody is to be. All the Water Companies can do is to prevent the entrance of organic and decomposing matter into the water. But this matter can have nothing to do with the production of typhoid fever, if it arises from infection, as Mr. Simon infers. More than this, by adopting the doctrine of infection, Mr. Simon tacitly acknowledges that the theory of sanitary reform, which he had previously advocated, and which he endeavoured to thrust down the throats of the public *nolens volens* for so many years, is a false one, at least as regards typhoid fever. Out of his own mouth, both he and his theory—his filth-theory—stand condemned. On this point Mr. Simon and I are of accord, it having been my object to show, a few years previously to Mr. Simon's adoption of the doctrine of contagion, that the then dominant theory of the day is as illogical as it is untrue.‡

\* See "The Antidotal Treatment and Prevention of the Epidemic Cholera."

† Report of the Medical Officer of the Privy Council. 1867. P. 13.

‡ *Idem* Causation and Prevention of Disease. 1859.

It would, in fact, have been a strange anomaly in the order and dispensations of Providence, if that process, which is the cause of life, of growth, and of health, to plants, should become the agent and the medium of disease and of death to man. Fortunately it is otherwise. So far from the emanations arising from the decomposition of organic matter, and particularly of that which forms the excreta of man, being the cause of disease, they act rather as a preventive. Does any one doubt the fact? Let him, before uttering an exclamation of surprise or of derision, peruse the evidence contained in the work just alluded to, as also in another subsequently published ("Epidemiology"), and he will then, perhaps, be as convinced as myself of the truth of the above conclusion. If, also, he will turn to the histories of the various outbreaks of disease there given, he may probably infer, that the contamination of the water by sewage or fecal matter has no influence in the production of either cholera or typhoid fever. The adoption, by Mr. Simon, of Dr. Budd's theory is the more singular, in consequence of this writer, like Dr. Snow, repudiating his *filth*-theory. Although Dr. Budd allows that the sewers are the principal channels through which typhoid fever spreads, he adds, "that they propagate it *solely* in consequence of being the channels for the diffusion of this (infectious) poison," not in consequence of the emanations that arise from the decomposition of fecal or other matter. "The living human body," adds Dr. Budd, "is the soil in which this specific poison *breeds and multiplies*."\* On the other hand, the Founders of sanitary reform rejected the doctrine of infection. Both theories cannot, in fact, be true, for if the one be true, the other will necessarily be false. Having concluded that the first is untrue, it only remains to ascertain whether the last be sounder than the former. This we shall be better enabled to do after studying the history of the outbreak at Lewes, which has been referred entirely to infection.

\* Loc. cit., p. 37.



## THE OUTBREAK OF FEVER AT LEWES.

UNLIKE Over Darwen, Lewes is considered to be a remarkably clean town, while it has been "blessed," for some years, with a system of house drains and sewers, although a large proportion of the houses still have cesspools. Lewes has also been, from time immemorial, one of the healthiest towns in the kingdom—and it is curious how the most healthy towns have been so frequently selected for this operation—still it or the sanitary authorities were not satisfied: they wanted to be more healthy; had drains made, and have since experienced two outbreaks of typhoid fever—in 1872 and 1874. Like the man on whose tombstone these words were written: "I was well, would be better, took physic, and—died!"

In order to ascertain the facts connected with this outbreak, I shall, not having seen any official Report, refer to the Report, or rather *vivâ voce* statement, made by the Government Inspector, Dr. Thorne, to the Lewes Sanitary Board in November last.\* Dr. Thorne observed:—"Enteric fever is *always* found in association with excremental pollution of air or water. For example, if the *poisonous* (i.e., infectious) evacuations of a typhoid patient get into a stream of water, or sewage from a cesspool into wells or into water derived from other sources, they are capable of communicating the disease; or, again, if the poisonous evacuations pass into a sewer, and there is a connexion between the sewer and houses, so that the polluted air from the sewer could pass into them, the disease is capable of being conveyed thereby." Having laid down these propositions, it was necessary to search for facts in support of them; thus reversing the Baconian, or inductive, method of reasoning. This is to collect your facts first, and then to form your theory; or, as a certain lady, in her work on cookery, quaintly remarks, "Catch your hare first, and *then* dress it." The lady in this case was more philosophic than the doctor. But to proceed. As Dr. Thorne thus refers the outbreak at Lewes to contagion, and as there are different theories of infection, it is necessary to add, that the most recent is what is termed the Germ theory. According to this doctrine, the matter of contagion is composed of the lowest organisms, or organic particles, being produced in the blood of man and then discharged by the various secretions, but principally by the alvine evacuations; by which means they find their way into the drinking water, or become diffused in the surrounding air. Although their existence has never been demon-

\* The account is taken from "The Sussex Express," which contained a full report, November 23, 1874.

strated, it thus appears that these invisible entities possess the faculty of living in the blood of man, in the water that he drinks, and in the air that he breathes—somewhat different media, but that is immaterial. There are some theorists who can overcome, if they cannot explain, all difficulties.\* Although Dr. Thorne does not say so explicitly, still, as he speaks only of the *particles* of diseased evacuations, *not of the matter* of contagion, we may presume that he adopts this theory. At all events I shall, in the absence of all evidence to the contrary, assume that such is the case, more especially as it would be impossible to account for the propagation of the disease in the way pointed out by Dr. Thorne, excepting by the multiplication of living germs or entities.

The way in which the infection was conveyed to the inhabitants of Lewes, according to Dr. Thorne, is as follows. It appears that there are about twelve houses in Lewes in which the service pipes come direct to the closet, without the intervention of a cistern. "These service pipes," says Dr. Thorne, "have existed unfortunately in houses where the earlier cases of typhoid fever have occurred; the open (?) pipe was attached to the closet-pans containing the evacuations of typhoid patients (the evacuations could not have been in the pans, they must have been in the cesspools or in the sewers), and from the manner in which the pipe entered the pan it was all but impossible, to my mind, that *particles* of the evacuations themselves could have escaped being drawn up into the mains, so great is the suction." Although Dr. Thorne speaks above of the pipe being an open one, he stated previously, "Unless the pipe is kept *closed*, and we found *instances* where the pipes are kept open, there is great danger of air being drawn into the mains from the closet pans," thus showing that there were taps to them, and, consequently, that they would not be always open. That gaseous matter from the closets may find its way into the supply-pipes, when open, is possible, but not very probable. When the water ceases to flow, the pan will be filled to a greater or less extent with water, thus preventing, even if the closets have no traps, the escape of all emanations from the cesspool or the drain, for the moment. In the meantime, the atmospheric air, the pressure of which is so great and so regular, would rush in and fill up the vacuum in the pipe, thus leaving no room for the introduction of other gaseous matter. That which escaped subsequently from the pans would be diffused, with more ease and with greater rapidity, in the surrounding space, more especially as only a small quantity of it could come into contact with the end of the pipe. Allowing, however, that gaseous or other matter from the closets entered the pipes, what then? Why, the first rush of water from the reservoir would expel it, together with the air contained in the main and pipes, without the least chance of either the one or the other mixing with the water. In order to absorb gaseous

\* For an analysis of this doctrine, see "Epidemiology," p. 34.

matter, the water must be at rest and in contact with it for a certain time, while there are some gases that are only absorbed by water in the smallest possible quantity. What the case would be with these living germs, or particles, we know not, but we might conclude, that they would be less easily absorbed than gaseous matter. That the air or other matter contained in the pipes would be expelled, instead of being absorbed, on the first rush of water from the mains or the reservoir, may be inferred by a circumstance mentioned by Dr. Thorne himself. He remarked :—"One gentleman told me, the noise of its (the air) rushing out into the closet-pan was so considerable as to wake him up, when the water was turned on at six o'clock in the morning." Mr. Ellman also stated, at the same Meeting, that, "about two months ago, a tap was turned on at Spital-barn and a stream of air rushed out. *Some time elapsed before a pint of water came*"! We may therefore conclude, that the contamination of the water from this source was a physical impossibility, and could not, consequently, have been the cause of the propagation of the disease to other houses. This conclusion is confirmed by another circumstance. It does not appear, that the disease prevailed to a greater extent in the suspected houses than in others; and yet, if these emanations were so great and so deleterious, when distributed through all the pipes leading to 900 or 1,000 houses, none of the residents in the houses whence they arose, and in which the air must have been saturated with them, could have escaped an attack if not death.

Lastly: if the propagation of the disease in Lewes were due to these circumstances, it was absolutely necessary to show, that the first cases occurred in these houses; otherwise, we should be obliged to look to some other cause for its origin and spread. My readers will no doubt be surprised, after the preceding arguments and conclusions, to peruse the following confession of Dr. Thorne. "Now one thing was wanting to support the theory, that the *poisonous* excrement of fever patients having been thrown into the closet pans had got into the water mains. I therefore went into every case, and enquired into the history of the families, and there was abundance of evidence to show, that *they had had no previous case of enteric fever; i.e.,* I carefully sought to ascertain whether, before the more general outbreak, the evacuations of any person suffering from enteric fever could have been cast into the water closets—but I *found none.*" "Again," continues Dr. Thorne, "pollution in the mains would not account for the attack at the County Prison: the two mains by which it is supplied have always been kept charged for a considerable extent of their course." Another hypothesis, therefore, was required, in order to account for the origin of the disease in the town, and for the outbreak in the prison. It is as follows :—

It appears that the springs, which supply the town water, communicate with the Cockshoot—a tidal stream—the water from which is prevented entering the springs by a sluice. But, when this sluice was



examined in August, a boulder of chalk, which prevented the valve from shutting, was found lying against it. As, also, there was a high spring tide *in the middle of July*, it has been inferred by Dr. Thorne, that some of the water of the Cockshoot became mixed with the water in the springs; and, as the Cockshoot communicates with the Ouse, which receives the sewage of the town of Lewes, Dr. Thorne further concluded, that the spring-water had in this way become contaminated. We have thus three hypotheses—for not a particle of proof has been advanced in support of either: 1st, That because a boulder of chalk was found against the valve of the sluice, in the month of August, it must have been there in the middle of July. 2ndly, That infectious germs were present in the river Ouse at this time; and, 3rdly, That they found their way into the springs during the high tide that then occurred. Let us see, then, how the subsequent facts tally with these hypothetical conclusions.

Passing over the question of the boulder, as immaterial at the present moment, we have first to ascertain how the infectious matter got into the river Ouse before the outbreak. Dr. Thorne states:—"I find, from time to time, there have occasionally been cases of typhoid fever in Lewes,—two certainly occurred in May and June last,—and, therefore, without being *particularly critical* in examining the history of these cases, it would appear that *diseased evacuations* were passing into the river right up to the month of July in this year."

As there are as many houses in Lewes with cesspools as with water-closets, and as we are not told that the houses in which these patients resided contained the latter, we have no proof that diseased evacuations did pass into the river before the outbreak. Granting, however, that such were the case, still, as there must have been an interval, possibly of some weeks, between the convalescence or death of these patients and the overflow of the river into the springs, the diseased germs would, during that period, have been carried by the receding tides into the sea, and have been dispersed far and wide. Then, again, supposing that Dr. Thorne's inferences were correct, we should have to enquire how the two patients, the cause of all this evil, had become infected? It could not have been from the water, as no contamination had then occurred. No information on this point having been afforded, we may conclude, that the source whence they had derived the disease could not be discovered. Had such been the case, and had it been possible to have traced the disease, in these instances, to some imaginary source, we should then have been no nearer a solution of the question; for we should still have to enquire how the first cases arose,—in 1812 in France, and in 1827 in England. As these could not have been derived from any human source, it shows that there is a cause, irrespective of infection, productive of this disease. If so, it is more logical to infer, that the cause which produced the disease in the first instance, is the same as that which produces it in all others: according to the good old philosophical maxim that like



effects must be produced by like causes. It is, besides, contrary to all analogy, to the laws of nature, and to the axiom laid down by Newton,—viz., a multiplicity of effects, but a paucity of causes—to suppose that there are two different causes in operation productive of precisely the same results.

Irrespective of these arguments, we have proof—positive proof—that the outbreak of fever in Lewes was not caused by the contamination of the water. In the first place, if the water had become infected, in the manner pointed out, the whole of it would have been contaminated—at least after a time—not a portion only, for it all comes from one reservoir; while the springs at the expiration of three or four weeks would have swarmed with these living entities. Dr. Farr, referring to the propagation of cholera by these germs, remarks:—“It may appear, at first sight, impossible that the cholera flux of one or more patients should produce any effects in the waters of a river like the Thames. But living molecules, endowed with the power of *endless multiplication*, are inconceivably minute, and may be counted by *millions in a drop of water*.”\* If this be true, all the persons that drank the town water ought to have been attacked; instead of which, out of a probable population of 5,000, there had only been 325 cases up to the end of November, and the disease had then nearly subsided. Then, again, it is precisely when these infectious germs would have existed in the greatest number, and to the greatest extent, that the disease is suddenly arrested, and subsides more rapidly than it rose, although nothing was done to destroy these entities, it being impossible to do so when diffused in drinking water, for all the disinfectants in common use are *poisonous*! This is not all: these germs, it is said, increase and multiply, and with greater rapidity, in the blood. Dr. Beale remarks:—“The poison when it enters (the system) may be so infinitesimal in quantity, that it can neither be measured nor weighed, *nor*, under ordinary circumstances, *seen*; but, having gained access to the blood and tissues, it increases to such an extent that, in many cases, sufficient is produced *in one subject* to infect hundreds of persons—the *population of a town, or even a whole country*.”† According to this doctrine, not only ought all those who drank the water to have been attacked, but they ought all to have died, as not only the water but the blood would have swarmed with them. Nevertheless, only twenty-seven persons had been destroyed by these voracious entities—endless in number as well as in multiplication—at the end of November, and there have not been many deaths since. We may therefore conclude, that this infection-theory, like the filth-theory, is as untrue as it is absurd. That this doctrine is false may be shown by other facts. To test the truth of

\* So far from having been counted, these molecules have never yet been seen by the most powerful microscope. Their existence, therefore, is as problematical as that of the man in the moon.

† Microscopical Journal, Oct., 1870, p. 205. See also Disease Germs, by Dr. Beale.



his theory, Dr. Beale examined the blood of animals that had died of the cattle-plague—supposed to be produced by the same cause—with the highest magnifying powers that exist, viz., one-fifth of an inch focal adjustment. “This magnifies 2,800 diameters; or, to express the magnifying power by some examples, an inch would appear to extend 111 yards, and a child three feet tall would look as high as Mont Blanc. With such power, particles of even 1,100,000th of an inch in diameter, having no distinct character, would not be passed over. But he (Dr. Beale) has found *no definitely formed substance* that can certainly be said to be the cause of the cattle-plague”<sup>\*</sup>—a sure proof that these living entities are not present in the blood of the sick, only in the brains of these theorists.

Lastly, 87 persons were attacked that did not drink the town water, the houses in which they reside being supplied from private wells. As the attacks in these instances cannot be referred to the contamination of the town water, and as no attempt has been made to show that the wells in these houses had become infected, we are certain that some other cause was in operation, productive of the disease in Lewes. As such, we may conclude, that the unknown cause which produced the disease in the latter instances was also the cause of the attack in all the other cases,—the contamination of the town water being insufficient to account for the phenomenon. It only remains, therefore, to ascertain what this cause really is.

<sup>\*</sup> Third Report of the Cattle Plague Commissioners, p. vi.

## THE CAUSE OF ENTERIC FEVER.

It has been already stated, that this disease was unknown in France until 1812, or in England until 1827. A new cause, therefore, must have been brought into operation in order to produce this new form of disease. What then is the cause, it will be asked? The answer is not so difficult as it may at first sight appear. If we extend our inquiry we shall find, that a particular operation was commenced in each country about the period of the advent of typhoid fever, viz., the drainage of marsh lands in France, and the drainage of similar lands and towns in England,—what is termed Sanitary Reform having been inaugurated in 1825. More than this, typhoid fever has been gradually increasing, both in extent and in intensity, in England from that day to the present, and *pari passu* with the carrying out of surface drainage and of sanitary measures. Although coincidence is not cause, still, so singular a coincidence as this would seem to show, that there is some connexion between the one phenomenon and the other. This is not my opinion only, but that of a French writer—M. Boudin. He remarks :—"The drying (or drainage) of the soil, or its conversion into a lake,\* while producing the disappearance or diminution of paludal diseases (as ague), appears to predispose the organization to a new pathological condition, according to the locality, and in which phthisis and *typhoid fever* play a prominent part."† It is a well-known fact, and has been particularly dwelt on by me, in the work just alluded to, that the drainage of marsh lands has the effect of producing a diminution or cessation of ague, and sometimes of the severer forms of fever. But it is no less a fact, that the drainage of the land sometimes renders a locality more insalubrious than before. Thus, the drainage of the marsh called "La Chartreuse," near to Bordeaux, was followed by a severe outbreak of fever that lasted many years. In 1802, the disease was so general that 10,000 persons were attacked, and 3,000 died. The same result has been observed in the Pontine Marshes, on which vast sums have been expended, but only to render the plains, where large cities formerly stood, uninhabitable.‡ It is, in fact, during what is termed "the drying process," or the conversion of the marsh into a hard surface that the most severe forms of inter-tropical fevers are observed.

Independently of these reasons, another circumstance may be mentioned confirmative of the opinion that typhoid fever is produced

\* For an explanation of this result, see "Causation and Prevention of Disease," Law iii., page 78.

† Etude de Géologie Médicale, 1848.

‡ Hence the injunction of Apollo to the Greeks, Μη κρεί Καμαρίαν—do not disturb Camarina—a pestiferous marsh.

by emanations from the surface ; this is, that it generally arises, like ague, in the autumn. Hence, it has been termed in New England, America, the autumnal, or fall, fever. Although not now a common complaint in England, and we know the reason why, ague is only one out of a numerous class—all those termed endemias—that are produced by the same cause, viz, malaria, or marsh poison. That typhoid fever is a product of the same agent, other and more direct proofs can be afforded. For instance, the town of Winterton, Lincolnshire, is, according to the Report of Dr. Thorne, “on high, sloping ground ; and, being built on the *oolitic* formation, which is very porous, the natural drainage is, of course, very good.” In addition to this, a *very efficient* drainage had been laid through the town a few years previously, *i.e.*, in 1863. Nevertheless, Winterton, we are told, suffered from typhoid fever to a slight extent for several years, but more severely in 1865-6, and again in 1867. Dr. Thorne also states :—“Ague was, up to thirty years ago, very prevalent in the district ; but, since the neighbourhood has been properly *drained*, *no cases* have occurred.”\* Exactly so ; they have been replaced, as we have seen, by typhoid fever. Take another example. Mr. Cass, surgeon, of Goole, states that, “Thirty-seven years ago, when he first went there, intermittent fevers were very frequent, but *not* often *severe* in form.” About this time, “extensive drainage of the land in this district was effected,” the result of which has been told by Dr. Whitley, who remarked :—“There has been much typhoid fever of late years, and much zymotic disease prevailed at the time of my visit.” Mr. Cass also stated, that “the mortality from phthisis had been *very high* for many years.”†

Although such has been the result in particular spots, or marshy districts, it does not appear that phthisis, generally speaking, has been on the increase in England of late years. What it was formerly we have no means of ascertaining, there having been no regular registration of deaths, excepting in London, until 1838 ; but it is evident, that there was a great increase in the prevalence of phthisis during the last century—and it is the only disease in which there was an increase—as we shall find by turning to the bills of mortality for London. Thus the deaths from this cause, in 1700, were 2,678, being a ratio of 3.97 per 1,000, according to the population returns ; but, in 1800, the deaths amounted to 5,721, being equivalent to 6.35 per 1,000, a ratio nearly double what it was in 1700. This increase may, doubtless, be referred to the drainage of the land in the neighbourhood of London and elsewhere, as shown by the gradual subsidence of ague during the above period. Up to the middle of the last century, when they prevailed epidemically, agues were as common in England as they now are in Italy, but they are rarely met with at present. They have been replaced, in all probability, by phthisis,

\* Mr. Simon's Report for 1867, p. 28.

† Sixth Report of the Medical Officer of the Privy Council, p. 444 (1863).



this disease being now the principal endemic of England. In 1871, the deaths from phthisis were 53,376; in 1838, the first year when the deaths were registered, they amounted to 50,025. Calculated according to population, this would give a ratio of 2.36 per 1,000 in 1871, and of 3.93 in 1838. There has thus been a considerable diminution in the mortality from phthisis during the last thirty years. Whether this diminution is to be referred entirely to the lesser prevalence of the disease, or to a more efficacious mode of treatment, it is somewhat difficult to say. That the diminution is to be ascribed, in part, to treatment, may be inferred from the fact, that there has been a considerable increase in the mortality from all other affections of the lungs. Thus, the deaths from diseases of the respiratory organs, such as pneumonia, pleurisy, &c., but exclusive of phthisis, were 29,060 in 1838, and 81,825 in 1871. Calculated on the population, this would give a ratio of 2.61 per 1,000 in 1838, and of 3.62 in 1871, 1 per 1,000 more. It may be, also, that the state of the superficial strata, which was formerly so favourable to the development of phthisis, may be less so now, in consequence of a change in their dryness or hardness, the prevalence of all diseases being regulated by this circumstance, not only as regards different localities, but the same locality.

With these facts before us, it is easy to understand how the drainage of towns, which necessarily includes, to a greater or less extent, surface drainage, has been productive of similar results, with this only difference, that typhoid fever would appear to have replaced typhus, ague not being usually met with in large towns.\* Independently of the ill effects of surface drainage, there is another, still more serious, produced by the construction of sewers and drains; this is, the loosening of the soil, and the formation of apertures, or communications, from the interior to the exterior. This has always been found to be injurious in every situation and in every climate; and it is to this circumstance, more than to the surface drainage, that we must ascribe the outbreaks of disease that have so frequently followed the completion of sanitary works. We had an example of this at Launceston, where a severe visitation of scarlet fever was experienced soon after the application of the Public Health Act of 1848, while the aggregate of the mortality was greater than before. There was also an outbreak of epidemic fever at Shipley, shortly after the formation of house-drains, sewers, &c. A similar result was observed at Croydon, in 1852. An inquiry having been ordered by the Home Secretary of State, two of the Commissioners, Dr. Arnott and Mr. Page, state, in their Report:—"The main facts which have led to the present inquiry are, that in Croydon, where *no such epidemic is known to have existed before*, there have been, since August last, in a population of about 10,000, about 1,800 cases of fever, with a

\* Not only may we infer that typhus is a paludal, or malarious disease, but that the plague is produced by the same cause. See "Epidemiology," p. 77.

mortality of about 60 ; and that all this has happened during and since the execution there of 'New Works,' *intended to improve the sanitary condition of the town.*" More than this, all the Commissioners combined—and several Commissions were issued—were unable to assign a cause for the outbreak. The Sanitarians were modest in those days ; they did not attempt to explain, by a reference to their favourite theory, what cannot be explained. The same effect, and from the same cause, was observed at Sandgate, in 1854, excepting that, instead of fever, an outbreak of cholera occurred, although it had never experienced such a visitation before, Sandgate, like Croydon, having always been a remarkably healthy town.\* Again, in the same year, the most severe visitation of cholera that has been observed in England occurred in the Golden-square district, London ; and this, too, followed the formation of a new sewer, laid down in 1851 and subsequent years, in accordance with the plan recommended by the then Board of Health. Although the disease was not confined to this district, still, the cases here presented so severe and malignant a type, that they resembled more those met with in inter-tropical, rather than extra-tropical, climates. More than this, it was precisely along the line of the new sewer, that the disease prevailed to the greatest extent, and in its greatest intensity. Typhoid fever has followed the same rule. At the Meeting of the Social Science Association, in 1862, Dr. Bennett, while referring to the prevalence of typhus and typhoid fever, remarked :—"The latter has recently appeared in Edinburgh ; and, strange to say, it appears to have *followed the improvements.*" And Dr. Christison, the President, added :—"Our street-drains, in the Old Town, had been much improved *during the very period* that enteric, or typhoid, fevers have been increasing. . . . Further, this disease does not, by any means, generally break out where the streets are ill-drained, water-closets wanting, and habits filthy." On the contrary, it is precisely in other situations that we must expect typhoid fever to occur—the reasons for which must be self-evident. We may therefore conclude, that if the town of Over Darwen had been more generally and more effectually drained—for a main sewer, into which the surface and some of the house-drains are led, runs through the principal street of the town—the outbreak would have been more severe. We may also infer, that if the town of Lewes had refrained from making house-drains, and laying down water-pipes, in order to replace the cesspools and the wells, it would have escaped its late visitation. But these evils are as nothing compared to those that will hereafter arise, when the present spic-and-span new drains and sewers become dilapidated and fall into ruin, like the *cloaca maxima* in Rome. We shall then find out what it is to make subterranean passages for the extrication of gaseous matter from the interior to the exterior of the globe.

\* For an account of these remarkable visitations, see "Causation and Prevention of Disease," p. 126, *et seq.*

## CONCLUDING REMARKS.

If the preceding arguments be sound, and if we infer that typhoid fever is, like ague, a paludal disease, and it would seem difficult to draw any other conclusion, we shall be enabled to arrive at some important deductions on the subject. In the first place, we shall know that typhoid fever is not produced by the emanations arising from night soil, or from the contamination of the water by the same matter; the worst forms of fever met with in inter-tropical climates being in uninhabited districts, not in populous towns and villages. Some of these pestiferous tracts are, indeed, not habitable. In the next place, we shall have proof that typhoid fever is not infectious, for no one who has had the least experience with malarious diseases would dream of considering them infectious. Even the severe continued fevers of inter-tropical climates are absolutely non-infectious; they cannot be propagated from individual to individual under any circumstances whatever. And, lastly, we shall have proof that this modern disease is not caused by the contamination of the water, and for the simple reason that malaria is not absorbable by water. Of this fact no doubt can possibly exist, it having been recognised and acted on from the time of Hippocrates to the present day; the beneficial effect of covering a pestiferous spot with water being referrible to this circumstance.\*

As to the apparent anomaly, that the majority of persons attacked in Lewes drank the town water, it may be explained in different ways. As malaria, like the poison of cholera, is never equally diffused in the atmosphere—attacking a town to the exclusion of the suburb, or *vice versa*; one side of a river and not the other; one side of a street, the opposite not presenting a single case; and even particular houses in the street—it may have been merely a coincidence, that the houses thus brought within the influence of the poison were supplied with the town water. On the other hand, it may so happen, that greater facilities exist for the extrication of the poison in or near the houses attacked than elsewhere; a result that must inevitably occur wherever water pipes are laid down or house drains and sewers made, as previously explained.† Which was the actual cause in Lewes it would be difficult to determine, without a local examination and investigation, which, if it were in my power, I have neither the wish nor the intention to make. My object on the present occasion is, not so much to point out what was the immediate cause of the outbreak, that is to say, the local circumstances, or conditions, that favoured the extrication of the poison from the surface, as to prove that this disease is not an infectious one, but a product of that well-known agent malaria.

\* See "Causation and Prevention of Diseases," p. 80.

† For the *laws* regulating the extrication of malaria from the surface, and its diffusion in the surrounding atmosphere, see "Causation and Prevention of Diseases."



As it is apparent from these facts, that the theories entertained by the medical officers of the Government Local Board are illogical and false; it follows, that the measures which have been adopted in accordance with these theories are useless, if not injurious. Of the truth of this conclusion better proof can be afforded than mere argument or scientific deductions, however logical. It can be found in the returns, and in the statistics of the Registrar-General, and in the old bills of mortality for London. If we examine the latter tables, we shall find that from 1750 to 1830 epidemics were unknown; that all ordinary diseases declined rapidly, and that the general rate of mortality was the lowest that had been observed previously, or that has been obtained since. While diseases declined, longevity increased. Thus, in 1750, according to the Parliamentary Returns, 1 in 21 of the inhabitants of London died annually; in 1800 1 in 36, and in 1811 only 1 in 38. But from 1830 to the present time—being precisely that of the inauguration of Sanitary Reform—epidemics have raged periodically; *three* new diseases have made their appearance, viz., cholera, diphtheria, and typhoid fever, and all ordinary diseases have been on the increase.\* And yet, with these facts staring us in the face, there are men in the present day who have the audacity or the temerity to affirm that Sanitary Reform is to banish disease from the earth. But assertions are not facts, nor will they disprove facts; and these show, without any fear of contradiction, that Sanitary Reform has hitherto produced no actual beneficial result, even after a full and unlimited trial of forty years. We may, in fact, appeal to Mr. Simon's own acts and avowals for a confirmation of this conclusion, for if the theory on which Sanitary Reform is based be true, why adopt another, and a totally different one? It is not typhoid fever only, but cholera and diarrhoea, that are produced and propagated by infection. In 1854, we were told by Mr. Simon, that "the general liability of London to suffer the epidemic visitation will cease whenever an efficient and inodorous system of drainage is established." But now, in order to guard London and England from visitations of cholera, the coasts are to be watched, ships are to be placed in quarantine, individuals on shore are to be isolated, while among the dangers which have to be guarded against, as favouring the spread of cholera infection, are, "outflow, leakage and filtration from sewers, house-drains, privies, &c., &c."† So that, what was before pointed out as a panacea for all the ills to which flesh is heir, is now regarded as a source of danger—the cause of death rather than the cause of health. Can inconsistency go farther than this? Really, the drains and sewers may say, as many persons have said of themselves, preserve me from my friends, I will defend myself from my enemies. As, also, typhus, measles, scarlet fever, and smallpox are all considered to

\* See the Statistical Tables in "Epidemiology," pp. 119—122.

† See "Memorandum of Precautions to be taken against the *Infection of Cholera*." Mr. Simon's Report, 1874.

be purely contagious diseases, there is nothing left for Sanitary Reform to effect, as Mr. Simon has himself indirectly, and, perhaps, unconsciously, avowed. To the question put by the Chairman of the Vaccination Committee, "Do you, or do you not, consider that sanitary improvements, both as regards dwellings, and as regards greater cleanliness of the person, might in themselves very much diminish the prevalence of smallpox?" Mr. Simon replied, "I have no evidence that it can do so;"\* although, in 1854, the witness thus wrote; "For the permanent avoidance of epidemic diseases, cleanliness is the *sole* remedy.† As the same argument will apply to every other infectious disease, and as there is no general disease left, unless it be ague, that is not considered to be infectious, there is an end of the question. The removal of filth on the surface will not prevent the infection spreading from one person to another; while the only use of drains and sewers, according to this doctrine, will be to convey the poisonous matter into the rivers and springs, for the express object of poisoning Her Majesty's subjects. Instead of scavengers and officers of health, we shall require policemen and officers of death—*i.e.*, quarantine officers—and soldiers instead of engineers, in order to isolate patients, and to establish *cordons sanitaires*. The doctrine of contagion is either true, or it is false; if it be true, the measures emanating from it must be carried out in their integrity, and to the fullest extent; if it be not true, the carrying of them out to the slightest extent is a sin and an injustice—an injury to individuals, to society, and to commerce. Then, again, if this contagious doctrine be true, the sanitary measures previously alluded to will be superfluous; an inference that we are bound to draw for other and different reasons. I call therefore on Her Majesty's Ministers to issue a Royal Commission, in order to determine whether the country is to be put to any further expense in carrying out measures that may be entirely useless, if not injurious. Independently of the actual outlay, amounting last year to about eight millions, we suffer an indirect loss of nearly as much by the substitution of house-drains for cesspools. By the adoption of the former system, not only is the greater part of the excreta of man thrown into the sea, but the remainder, by its dilution, is rendered almost useless, at least for corn lands, where it is most wanted. As a manure for corn lands, and as a substitute for guano, it ought to be applied in a solid state. Unless to grass lands, water cannot be applied constantly, and unless this be the case, the sewage of towns can only be partially utilised, the supply being constant, not intermittent; while all attempts to separate the matter from the fluid in which it is contained, without destroying its fertilising properties, have proved failures.

Another result, scarcely less serious than the former, produced by the system of house-drains and water-closets, is the waste of one of the

\* "Report of the Vaccination Committee," p. 165.

† Report to the Common Council of the City of London.



necessaries of life—water. The average quantity of water used as drink only, by men, women, and children, is not more than 130 gallons in the year, or somewhat less than 3 pints daily. But, in London, the quantity now consumed for domestic and other purposes—a large proportion being for the water-closets—amounts, according to Mr. Denton, to 25 gallons daily, or 9,125 gallons yearly per head. Some communities, he states, are now receiving 50 gallons per head daily, or 18,250 gallons yearly; and he calculates that London, fifty years hence, if the population goes on increasing at the same ratio as at present, will require 200,000,000 gallons daily. Such a quantity could not be obtained without depriving other localities of their supply, or without drying up the springs that feed the Thames. “If the water which is now required, and which may hereafter be required for the population of London, were pumped up from the chalk beneath, the higher springs of the London basin, feeding the tributaries of the Thames and other rivers, would be gradually reduced, and *ultimately vanish*, to leave rural towns, villages, houses, and mills, dependent for water upon them (the springs), without any supply at all.”\* It was at one time proposed to bring water from Wales, but the adjoining populations naturally objected to this robbing of Peter to pay Paul; while, as it so happened, some of these populations were actually short of water during the past year. It is time, therefore, that this waste of water—and more especially the insane proposal for a constant supply, which means a constant waste—like that of the excreta of man, should be arrested, which can only be done by abolishing the present system of house-drains and water-closets. The system that ought to be adopted in its room is the dry earth system—a system that effects three great objects. (1) It prevents the emanations that arise from night soil, (2) it preserves the excreta of man for agricultural purposes, (3) it saves a great waste of water. Independently of the reasons already given for husbanding our supplies of water, there is another still more cogent. We are now living in an epidemic period—characterized by the advent of the epidemic cholera, and other *new* diseases—when droughts are sure to recur, for this phenomenon, with its attendant—famine—has been the invariable accompaniment of pestilential epochs from the most remote period to the present day. We have had proof of this lately by the famines in Persia, in India, and in Asia Minor, produced by previous droughts; and we shall have the same proofs hereafter in Europe and in England. A warning, in fact, was given us a few years since, if we are only wise enough to profit by it. But woe be to England, if, with a surplus population, dependent for a large portion of its food supplies on foreign countries, we exhaust, by waste and by folly, those springs on which we can alone depend, when the dew and the rain of heaven fail us.

\* Paper read by Mr. J. Bailey Denson at the Social Science Institution, December 14th, 1874.



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